

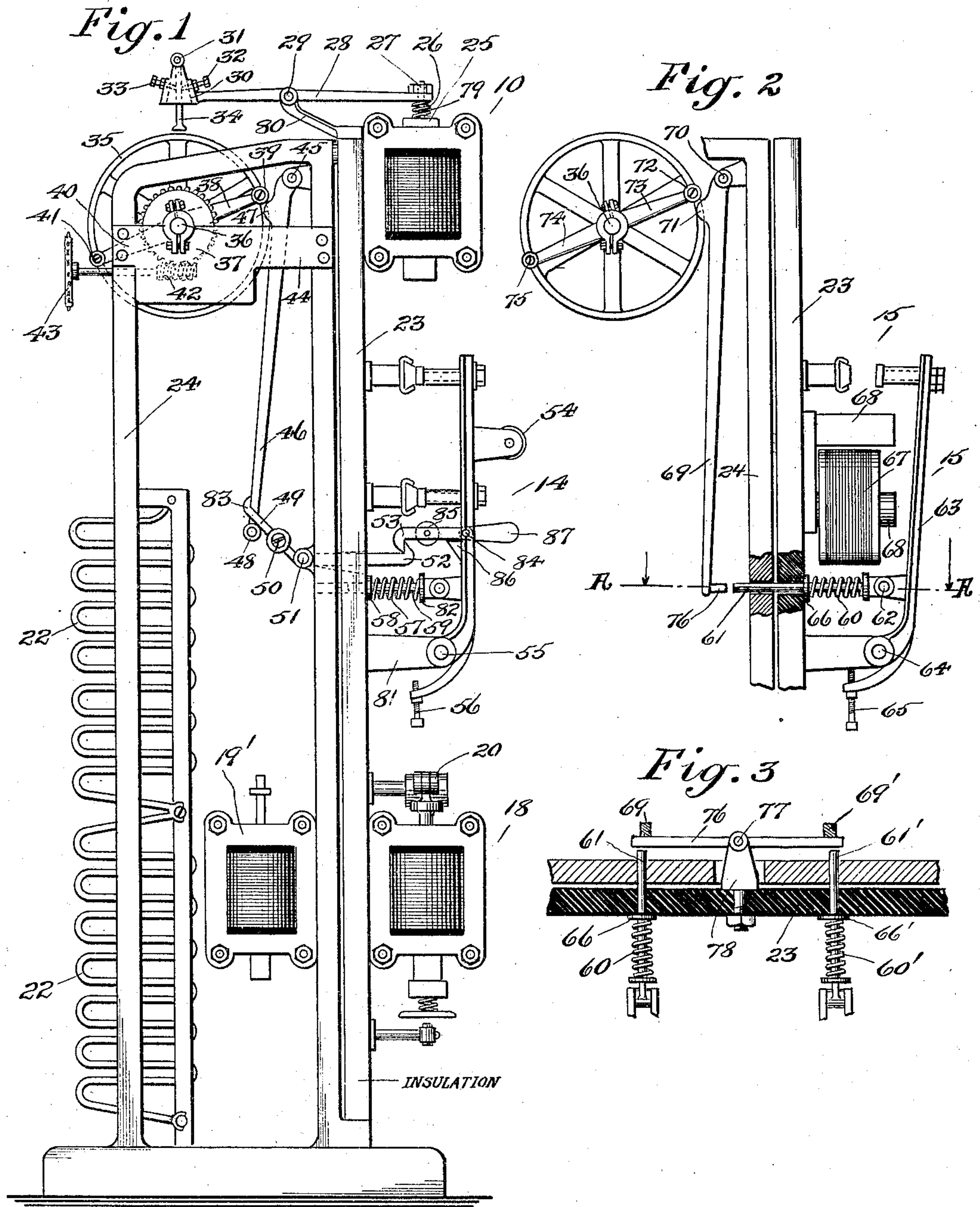
No. 848,405.

PATENTED MAR. 26, 1907.

A. SUNDH.
CURRENT CONTROLLING APPARATUS.

APPLICATION FILED JUNE 12, 1905.

2 SHEETS—SHEET 1.



WITNESSES:

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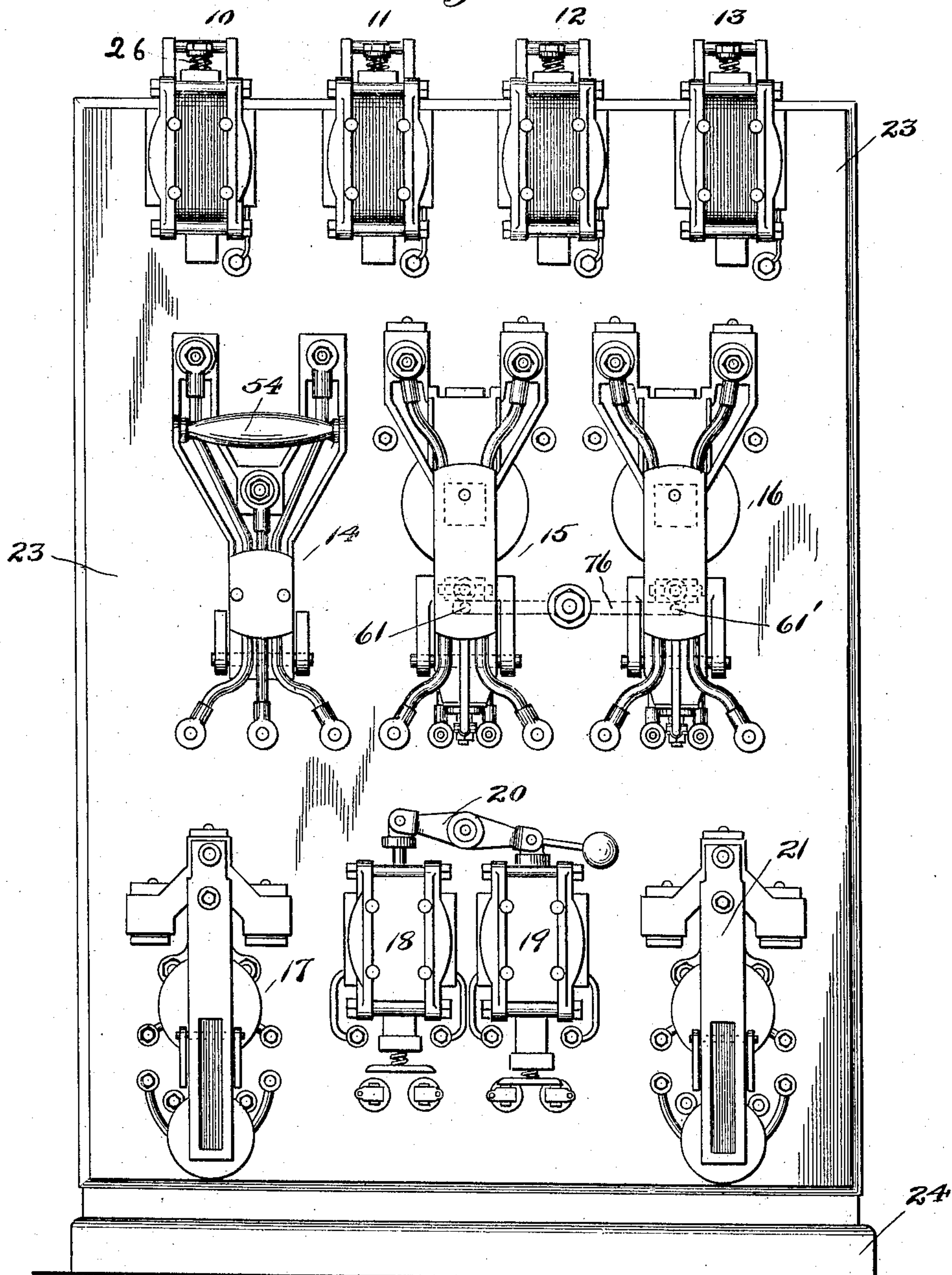
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Fig. 4



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UNITED STATES PATENT OFFICE.

AUGUST SUNDH, OF YONKERS, NEW YORK, ASSIGNOR TO OTIS ELEVATOR COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

CURRENT-CONTROLLING APPARATUS.

No. 848,405.

Specification of Letters Patent.

Patented March 26, 1907.

Application filed June 12, 1905. Serial No. 264,772.

To all whom it may concern:

Be it known that I, AUGUST SUNDH, a citizen of the United States, residing at Yonkers, in the county of Westchester and State of New York, have invented a new and useful Improvement in Current-Controlling Apparatus, of which the following is a specification.

My invention relates to current-controlling apparatus, and has for its object the provision of means for increasing the simplicity, efficiency, compactness, and safety of the various parts of such apparatus.

A further object of my invention is to so modify the circuit-breakers that they shall be positively actuated under certain conditions.

To these and other ends my invention consists of the arrangements and combinations of parts hereinafter disclosed, and pointed out in the claims.

My invention will now be fully described, reference being had to the accompanying drawings, in which—

Figure 1 represents in side elevation the means for mounting the parts and mechanism for throwing the main-line switch. Fig. 2 represents a side elevation, partly in section, of the means for opening one of the reversing-switches of an elevator-controlling system. Fig. 3 is a sectional plan view of certain details, taken on the line A A of Fig. 2; and Fig. 4 shows in elevation the front view of the controlling-board of an elevator system, with the electromagnet-switches and main-line switch mounted thereon.

In my copending application, Serial No. 249,430, is shown and described an automatic push-button elevator-controlling system employing single-phase alternating currents. It is to such a system of electric control that the present invention is particularly adapted, but may be used separately therefrom, if desired, or in any other relation.

In electric elevator systems in use at the present time it is usually the custom to employ what are known as "limit-switches," the purpose of which is to provide against the overrunning of the elevator-car beyond its normal travel. Such switch may be so situated with respect to the car, counterweight, or hoisting-machine as to be operated thereby when the car overruns its normal travel. The usual practice is to provide these limit-

switches with electrical contacts, which are included in the operating or switch-energizing circuits. The operation of such switches is at best very uncertain, since electrically-operated switches do not always upon a cessation of current in their energizing magnet-coils, return their parts to an open-circuited or deenergized position. This may be caused by any of a number of reasons, such as residual magnetism or sticking of the parts which may take place at the precise moment when it is desired to stop the machine. With my device the above troubles, together with numerous others, are absolutely overcome, the switches which are used to start and reverse the hoisting-motor being positively forced open by mechanical means operated by the hoisting-machine itself when the elevator-car reaches either the top or bottom landings. The current-supply to the motor is thus cut off and the brake applied. Furthermore, a similarly-operated means is applied to the main switch, which causes the latter to be forced open should the car for any reason overrun its normal travel, thereby cutting off the current-supply from the entire system.

Referring more particularly to Fig. 4, 10, 11, 12, and 13 designate electrically-operated relays, each relay corresponding to one of the floor-landings and operated from a landing or from the car by a push-button. These relays are similar in construction, and by referring to Fig. 1 it will be seen that they comprise a magnet-coil and casing 10 and a magnet-core 25, adapted to be raised by the magnet when the latter is properly energized. To the upper end of the core 25 is screwed a stud-bolt 79, which passes loosely through the lever-arm 28 and has a nut 27 at its upper end. The arm 28 is pivoted at 29 to a bracket 80, which is rigidly fastened to the switchboard 23 and has at one end the contact-holder 30.

34 designates a contact or brush carried by the holder 30 and pivoted therein at 31.

32 and 33 designate adjusting-screws, the purpose of which is to adjust the position of contact-brush 34 about the pivot 31.

Mounted directly below the contact-brush 34 is shown what I call the "floor-controller." It comprises a number of narrow drums, such as 35, the outside face of each having contact-segments mounted thereon,

which are insulated from the drum itself. These drums are rigidly mounted upon a shaft 36, which is supported by the cross-piece 44, fastened to the switchboard-frame-work 24. Upon the shaft 36 is rigidly mounted a gear-wheel 37, which meshes with a worm 42, the latter being connected to the sprocket-wheel 43. There is also mounted upon the shaft 36 the two arms 38 and 40, each arm having means for clamping itself rigidly upon the shaft and carrying at its outer end a roller, (shown at 39 and 41.) The sprocket-wheel 43 is connected by sprocket-chain or otherwise to some moving part of the hoisting machinery, preferably to a similar sprocket-wheel mounted upon an extension of the hoisting-drum shaft. The ratio of speed reduction between that of the hoisting-drum shaft and that of the controller-drums is of such amount that the rotation of the hoisting-drum between the limits of car travel shall rotate the controller-drums through an angle of approximately one hundred and eighty degrees.

The main switch 14 is adapted to be closed manually by means of the handle 54 and serves to connect the controller with the source of electrical supply through contacts carried thereon. This switch is pivoted about the rod 55 and is limited in its outward motion by the set-screw 56, striking against the standard 81. A spring 57 is supported upon a rod 59 between the collars 58 and 82 and is put under compression by forcibly closing the switch 14 when the spring tends to move the switch to its open position.

Upon closing the switch 14 a catch 53, pivoted at 84 thereto, engages a latch-bar 52, the latter being pivotally mounted at 51. The opposite arm 49 of the latch-bar 52 has an adjustable weight 50 mounted thereon. This weight 50 tends to move the arm 49 downwardly to raise the same to engage a roller 48 on the swinging arm 46. The weight 50 holds the swinging arm 46 in the position shown, as well as the latch-bar 52 in an engaging position, with respect to the catch 53. The catch 53 is also provided with a weight 85, a stop 86, and a handle 87.

The swinging arm 46, just referred to, is pivoted at 45 and has a raised portion or cam-surface upon it at 47, the latter being adapted to be engaged by the roller 39, carried by the arm 33. The arm 49 is provided with a hooked portion 83 for limiting the outward movement of the arm 46.

15 and 16 designate the reversing-switches, of which there are two. They are similar in construction and operated or closed by magnets. Each reversing-switch comprises a hinged framework carrying insulated contacts, which cooperate with other fixed contacts mounted on the switchboard 23 when the switch is in its closed position.

The switch-arm 63 (shown in Fig. 2) is pivoted at 64 and is limited in its outward movement to open position by the set-screw 65. A rod 61, connected to the switch-arm at 62, carries a compression-spring 60 and loose washer 66, the tendency of the spring being to keep the switch in its open position. The coil 67, together with its core 68, constitutes what is known as a "club-footed magnet" and when the same is energized operates to close the switch against the action of the spring 60.

A rocking lever 76, (see Fig. 3,) hinged at 77 upon the bracket 78, the latter being rigidly mounted upon the switchboard 23, is adapted to be rocked about the pivot 77 upon being pushed by either of the switch-rods 61 or 61'. The lever 76 is so arranged with respect to the rods 61 and 61' that while allowing either of the switches 15 or 16 to be operated it effectually prevents their being both closed at the same time.

Two swinging levers 69 and 69' are pivoted at their upper ends about the pivots 70. These levers are similar in construction, each having a raised portion or cam-face at 71, adapted to be engaged by the rollers 72 and 75 when the arms 73 and 74, each carrying one of these rollers, are revolved into a proper position to produce such engagement.

18 and 19 designate safety or non-interfering magnetic switches. These switches cooperate with each other, being connected by the rocking lever 20, attached to an extension of their respective plungers.

19' designates an inductive compensating resistance device for one of the non-interfering magnets. This inductive resistance device comprises a magnet-coil and frame mounted upon the back of the switchboard-frame 24.

17 and 21 designate electrically-operated switches, the purpose of which is to cut out or short-circuit the resistance 22 when the motor is being started or accelerated.

The operation of my automatic circuit-breaker is as follows: The main switch 14 is first closed by hand. The catch 53 striking the latch-bar 52 is forced upwardly against the action of the weight 85, and as soon as the switch is entirely closed the latch-bar 53 assumes the position shown in Fig. 1. The switch is held in a closed position by the latch-bar 52. At the same time a strong tension is placed upon the spring 57. The swinging arm 46 takes up the position shown in Fig. 1, the raised portion 47 being in a position to be engaged by either of the rollers 39 or 41. Upon the closing of a starting button or switch the magnet of a floor-relay, such as 10, will be energized to raise its core 25, which, by the intervention of the spring 26, causes the lever 28 to be rocked about the pivot 29 and the contact-brush 34 to engage or make contact with a segmental contact

carried by the drum 25. The connection thus made causes the operating-magnet of a reversing-switch, as 15, to become energized, thereby closing its contacts. The switch-arm 63 pushes the rod 61 against the rocking lever 76, causing the swinging arm 69 to assume the position shown in Fig. 2, said arm having the raised portion or cam-face 71 in a position to be engaged by the roller 72. The spring 26 tends to prevent chattering of the parts. The various other magnetic switches perform their allotted functions in a manner which leads to a proper operation of the controlling system and hoisting-machine. As the car travels in either direction the sprocket-wheel 43 is positively driven from the hoisting-drum shaft. This causes the shaft 36, together with the various arms and contact-drums mounted thereon, to revolve. Intermediate stops of the elevator-car—that is, stops other than at the top and bottom landings—are accomplished through the action of the contact-drums mounted upon the shaft 36. A circuit which maintains either of the reversing-switches in a closed position is broken by one of the contact-drums and a corresponding contact-brush to allow such reversing-switch to become deenergized and open its contacts, the spring connected to the switch insuring such opening. As the car reaches either the top or bottom landing, assuming that the reversing-switch 15 is closed, a circuit which is energizing this reversing-switch to close its contacts is broken by one of the contact-brushes, such as 34, and the contact-drum which it engages. The reversing-switch becoming deenergized will tend to open its contacts, assisted by the spring 60. At this time the arm 73 and roller 72 have been revolved by the hoisting-machine until the said roller engages the raised portion or cam-face 71 on the swinging arm 69. This swinging arm is now forced against the rocking lever 76, thereby causing the latter to be moved on its pivot 77. The lever 76 in turn pushes the rod 61 outwardly, forcing the reversing-switch 15 open, even though its magnet 67 be still energized. Should the reversing-switch 16 be operated to close its contact and the elevator-car has arrived at the end of its travel, a swinging arm 69' is operated by the arm 74 and roller 75 in a manner just described in connection with the reversing-switch 15, only in this case the push-rod 61' is forcibly actuated to open the reversing-switch 16 instead of the switch 15. Should the hoisting-machine by any possibility move the car beyond the top or bottom limits, one of the rollers 39 or 41 will be revolved to such a position as to engage the swinging arm 46 at the cam portion 47. Any further movement of the hoisting-machine causes the arm 46 and roller 48, carried thereby, to move the lever 49 and weight 50 upwardly about the pivot 57. The latch-

bar 52, being an integral part of the lever 49, will be raised out of engagement with the catch 53, carried by the main switch 14, allowing the spring 57 to open its contacts, thereby severing all electrical connection between the controlling system and the source of electrical supply. The revolving arms carried by the floor-controller shaft 36 may be adjusted about that shaft to such position as to cause the opening of the switches controlled thereby, at any other desired time.

While the automatic circuit-breakers just described are shown in the copending application above referred to in connection with an alternating-current system of electrical control, it is manifestly possible to apply the principle to almost any type of controller.

Having thus disclosed my invention, and without limiting myself to the precise details of construction or arrangement of parts, but reserving the right to vary the same within the spirit and scope of my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. The combination in an elevator of a motor-controlling-board with switching apparatus mounted thereon, a rotary floor-controller operatively connected to said switching apparatus, and single means for supporting the aforesaid parts.

2. In elevator apparatus, the combination of a controller board, with switching apparatus mounted thereon, a floor-controller operatively connected to said switching apparatus, and framework for supporting all of the aforesaid parts in adjacent relation.

3. In elevator systems, the combination of a controller-board with electromagnetic switches mounted thereon, a floor-controller mounted back of the said board, and a single frame for supporting the aforesaid parts.

4. In an elevator, the combination with a main-line switch, of floor-controlling apparatus and means coacting with said floor-controller for positively throwing said switch upon the elevator-car running beyond a predetermined limit of travel.

5. The combination in an elevator with an electric switch, of means for holding said switch in closed position, a floor-controller, a cam movable with a part of said floor-controller, and means coacting with said cam for releasing said holding means to open said switch.

6. The combination in an elevator with an electric switch, of means for holding said switch in closed position, a floor-controller, a rotary cam carried by a part of said floor-controller, and means coacting with said cam for releasing said holding means to open said switch.

7. The combination in an elevator with an electric switch, of means for retaining said switch in closed position, floor-controller, a cam moving with a part of said floor-con-

troller, means coacting with said cam for releasing said retaining means, and means for throwing said switch to open position.

8. The combination in an elevator with a switch, of a latch for holding said switch in closed position, a floor-controller, a rotary cam carried by a part of said floor-controller, and means coacting with said cam for releasing said latch to open said switch.

9. The combination in an elevator with an electric switch, of means for holding said switch in closed position, a floor-controller, a rotary cam carried by a part of said floor-controller, a cam-lever coöperating with said rotary cam, and means connected with said cam-lever for releasing said holding means.

10. The combination with an electric switch, of means for holding said switch in closed position, a pivoted lever having a cam-face, means connected to said lever for releasing said holding means, and a cam acting on said cam-face to actuate said lever.

11. The combination in an elevator with an electric switch, of means for retaining said switch in closed position, a floor-controller, actuating means for releasing said retaining means, and a plurality of rotatably-mounted cams for operating said actuating means and movable with a part of said floor-controller.

12. The combination in an elevator with an electric switch, of automatic means for holding said switch in closed position, a floor-controller, a cam carried by a rotating part of said floor-controller, and means coacting with said cam for releasing said holding means.

13. The combination with an electric switch, of means for holding said switch in closed position, a lever pivoted at its upper end, a projection on the lower end of said lever, and a cam for actuating said lever and projection to effect a release of said holding means.

14. The combination with an electric switch, of automatic means for holding said switch in closed position, a pivoted lever, a cam at the end thereof, means coöperating with said automatic holding means for releasing the same, and an additional cam for actuating said lever.

15. The combination with an electric switch, of means for locking the same in closed position, a pivoted lever, and means connected to said lever and coacting with said locking means for unlocking the same, means for limiting the movement of said lever in both directions, and means for actuating said lever.

16. The combination with an electric switch, of locking means therefor, a lever connected thereto, a pivoted lever, a cam at the lower end of said pivoted lever and coacting with said first-named lever, means on the first-named lever for limiting the outward movement of said pivoted lever, and means for actuating said last-named lever.

17. The combination with an electric switch, of automatic locking means for holding said switch in closed position, a lever connected thereto, an additional lever pivoted at its upper end, a cam at the lower end of said additional lever and arranged to actuate said first-named lever to effect the unlocking of said holding means, and a cam rotatably mounted adjacent the upper end of said additional lever for actuating the latter.

18. The combination in an elevator with an electric switch, of manual means for closing said switch, means for holding said switch in closed position, means coacting with said holding means for releasing the same, means for throwing said switch to open position upon release of the holding means, a floor-controller, and a cam coacting with said floor-controller for actuating said releasing means.

19. The combination with a floor-controller of an elevator system, of electromagnetic switches coöperating therewith, a supplemental switch, means for holding said last-named switch in closed position, and means actuated by said floor-controller for releasing said holding means.

20. The combination with an electromagnetic relay comprising a rotatable contact-carrier, an electric switch, means for holding said switch in closed position, relaying mechanism, an actuating device, and means for rotating said contact-carrier and actuating device to cause the latter to actuate said relaying mechanism to effect the opening of said switch at a predetermined time.

21. The combination with a floor-controller of an electric elevator system, said controller comprising electromagnetic relays and a rotatable drum, of a cam connected to rotate with said drum, an electric switch, means for holding said switch in closed position, and means coacting with said cam for releasing said holding means.

22. The combination with a floor-controller of an elevator system comprising a rotatable part, of cam-arms rigidly connected to move with said rotatable part, a main-line switch, means for holding said switch in closed position, and means coacting with said cam-arms for releasing said holding means to throw the main-line switch upon the rotatable part exceeding the predetermined limits of its normal rotation.

23. The combination with reversing-switches of a motor-controlling system, of means for preventing the closing of both of said switches at the same time, and automatic means for positively actuating the closed switch to open the same.

24. The combination with reversing-switches of a motor-controlling system, of electromagnetic means for holding said switches in closed position, mechanical means for preventing the closing of both of said switches at the same time, and means

for positively actuating one of said switches when closed to open the same.

25. The combination with the reversing-switches of an electric elevator system, electromagnetic means for closing said switches, a floor-controller, and means coacting with said floor-controller for positively actuating said switches to open the same.

26. The combination with reversing-switches of an electric elevator system, of electromagnets for holding said switches in closed position, a floor-controller, and means coacting with said floor-controller for positively opening the closed reversing-switch upon the movement of said controller to a predetermined limit.

27. The combination with reversing-switches of an electric elevator system, of a floor-controller rotatably mounted, electromagnets for closing and holding closed said switches, and means coacting with said floor-controller for positively actuating said reversing-switches to move the same to open position at or near the limits of rotation of said controller.

28. The combination with reversing-switches, of electromagnets for operating same, means for preventing the closing of more than one switch at a time, a rotatable floor-controller, cams rigidly connected to said floor-controller to move therewith, and connections between said cams and reversing-switches and arranged to be actuated by said cams to positively open said switches at or near the limits of travel of said controller and cams.

29. The combination with reversing-switches of an electric elevator system, of electromagnets for operating said switches, means for throwing said switches to open position upon deenergization of said magnets,

means preventing the closing of more than one switch at a time, a floor-controller rotatably mounted, cams secured thereto to move therewith, and means actuated by said cams for opening a closed switch upon the approach of one of said cams to a predetermined limit corresponding to a predetermined limit of travel of the elevator-car.

30. The combination with reversing-switches of motor-controlling apparatus, of electromagnets for operating said switches, plungers pivoted to the movable part of said switches, a pivoted lever having its ends adjacent the ends of said plungers to prevent the closing of more than one switch at a time, additional levers each having its lower end adjacent one end of said first-named lever, a floor-controller, and means connected to said floor-controller for actuating said additional levers to effect the opening of said reversing-switches.

31. The combination with reversing-switches of motor-controlling apparatus, of electromagnets for operating said switches, plungers pivoted to the lower portions of the movable parts of said switches, a lever horizontally pivoted and having its ends adjacent the ends of said plungers, pivoted suspended levers having their lower ends adjacent the ends of said horizontal lever, and a rotatable cam actuating said suspended levers to open said switches when said cam arrives at a predetermined point in its travel.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

AUGUST SUNDH.

Witnesses:

FRANK T. BROWN,
CHARLES M. NISSEN.